

**Executive Summary**  
**Risk Assessment**  
**828 Martin Luther King Jr. Boulevard**  
**Chapel Hill, Orange County, North Carolina**

Hart & Hickman, PC (H&H) has completed human health and ecological risk assessment activities for the property located at 828 Martin Luther King (MLK) Jr. Boulevard in Chapel Hill, Orange County, North Carolina (site). This document provides an executive summary of the risk assessment background, methodology, and results. Refer to the Risk Assessment Report dated October 7, 2021 for details regarding the assessment.

Background Information

Previous assessment activities indicated that the site was initially used as a borrow pit from the late 1950s to early 1960s, and then was used as a fill site by a previous owner for construction debris and coal combustion products (CCPs) from the mid-1960s to the mid-1970s. In the early 1980s, the Town of Chapel Hill (Town) acquired the property and constructed a building that is currently used for police department operations. The site consists of an upper level where the borrow pit was located which is now occupied by the police department building and associated parking areas, and a lower level adjacent to Bolin Creek where the Bolin Creek Trail (hereinafter also referred to as the greenway) is located. The upper and lower levels are separated by a steep embankment. The site layout and area of CCPs are depicted on Figure 1.

Assessment activities were conducted to investigate potential environmental impacts associated with CCPs at the site from 2013 to 2020. The investigation activities included collection and laboratory analysis of CCPs, groundwater, soil, sediment, and surface water samples. The results of the assessment activities identified concentrations of certain metals in soil and CCP samples and in perched groundwater zones within the fill material. However, groundwater assessment activities identified limited to no impacts in the underlying unconfined aquifer downgradient of the fill area. Assessment activities also identified no significant impacts to stream sediment or surface water in Bolin Creek.

Preliminary risk assessment activities were performed to evaluate risks for greenway users in the trail area in 2019. Based on the results, interim remedial measures (IRMs) were implemented in

2020. IRMs included excavation and off-site disposal of soil and exposed CCPs along Bolin Creek Trail, stabilization and cover of exposed CCPs along the embankment between the upper and lower portions of the site, and temporary measures to address stormwater and erosion control in the area of the embankment. Additional risk assessment activities performed after IRMs concluded that the greenway trail is safe for users. Under present conditions, CCP fill material at the site is covered by at least 2 ft of soil cover, with the exception of localized areas in the upper level with 1 to 2 ft of soil cover and areas of exposed CCPs along the embankment.

The Town is considering redevelopment of the site and has entered the site into the North Carolina Department of Environmental Quality (DEQ) Brownfields Program. The Town requested that H&H perform the additional risk assessment activities documented in this report to define the final measures recommended for the site as a whole to address CCP impacts, both under the current land use scenario and possible future redevelopment scenarios.

#### Risk Assessment Methodology

The risk assessment activities were completed in general accordance with DEQ and United States Environmental Protection Agency (EPA) risk assessment guidance (DEQ, 2020, DEQ, 2021a, EPA, 2018a, EPA, 2018b). For the purpose of risk characterization, the site was divided into three exposure units (EUs) that represent areas of similar land use and potential receptors. EU #1 encompasses the upper level in the vicinity of the existing police department building and associated parking areas, EU #2 encompasses lower level in the area of Bolin Creek and the adjacent Bolin Creek Trail, and EU #3 encompasses the embankment between EU #1 and EU #2. The exposure units are depicted on Figure 2.

For the human-health risk assessment, an exposure pathway evaluation was performed to identify pathways by which residents, non-residential workers, construction workers, or greenway trail users could be exposed to impacted media within each EU. Risks were calculated for each complete exposure pathway assuming conservative reasonable maximum exposures. The DEQ Risk Calculator was used to calculate potential cancer risk (CR) and non-cancer hazard index (HI). Based on EPA and DEQ guidance (DEQ, 2021a, EPA, 2018b) remediation or other measures to

address risks are recommended for calculated CR above one in 10,000 (1.0E-04) or HI of greater than 1.0.

The ecological risk assessment activities were limited to an initial screening comparison of detected concentrations to the Ecological Screening Values (ESVs) established by EPA Region 4. Per DEQ and EPA guidance (DENR, 2003, EPA, 2018a), EPA ESVs are based on conservative endpoints and ecological effects data, and represent preliminary screening criteria to evaluate the potential for ecological risk (or lack thereof). ESVs are not intended to represent remediation goals, and in some cases further data evaluation can be performed instead of proceeding directly to remediation for cases where ESVs are exceeded.

The primary compounds of concern for the site are metals associated with CCPs; however, naturally-occurring background levels of metals are also present, which are derived from the natural elemental composition of the source rock underlying the site. Background samples collected from the site contained concentrations of certain metals exceeding DEQ Preliminary Soil Remediation Goals (PSRGs) in soil and stream sediment, which are attributed to naturally-occurring metals in the parent bedrock. EPA and DEQ do not require remediation of concentrations below background levels (EPA, 2002, DEQ, 2021), since these concentrations represent naturally occurring conditions that are not associated with contamination sources. Note also that DEQ PSRGs are initial screening levels based upon conservative exposure assumptions. In accordance with EPA and DEQ guidance, risk management recommendations for the site are based on risk calculations with background metals excluded.

### Human-Health Risk Assessment Results

The human-health risk assessment results indicated the following:

- Human-health risk was evaluated for possible future residents in the area of EU #1 (upper level) and EU #3 (embankment). The results of the risk evaluation indicated that acceptable risk levels were exceeded for a future resident in both units (with and without background concentrations included), with risks being driven by the following sample locations: the manganese concentration in soil sample S-4 in EU #1 (upper level), and the arsenic concentrations in samples S-7, HH-10, and HH-11 in EU #3 (embankment). The

samples exceeding acceptable risk levels for a possible future resident are depicted on Figure 3.

- Human-health risk was evaluated for possible current or future non-residential workers in the area of EU #1 (upper level) and EU #3 (embankment). The results of the risk evaluation indicated acceptable risk levels for a non-residential worker in both units. Therefore, the site is considered safe for non-residential workers.
- Human-health risk was evaluated for possible future construction workers in the area of all three exposure units (upper level, lower level, and embankment). The results of the risk evaluation indicated that acceptable risk levels were exceeded for a construction worker in all three units, with multiple samples identified as risk drivers. If background concentrations are removed, acceptable risk levels were exceeded for a construction worker in EU #1 (upper level) and EU #3 (embankment). The samples exceeding acceptable risk levels for a possible future construction worker are depicted on Figure 4.
- Human-health risk was evaluated for possible current and future greenway users in the area of EU #2 (lower level) and EU #3 (embankment). The results of the risk evaluation indicated acceptable risk levels for greenway users in both units. Therefore, the site is considered safe for greenway users.

### Ecological Risk Assessment Results

The results of the ecological risk screening indicated the following:

- The area of Bolin Creek (EU #2) is the area with the highest likelihood of potential ecological receptors. The results of the risk evaluation indicated no significant ecological risk for surface water and sediment in Bolin Creek.
- Exceedances of ESVs for multiple metals were identified in samples of exposed CCPs collected along the embankment in EU #3 (S-7, HH-9, HH-10, and HH-11).
- Localized exceedances of ESVs were also identified at two soil sample locations within EU #1 (S-4 and MW-7) and one individual soil sample location within EU #2 (SED-13).

The samples exceeding ESVs for ecological receptors are depicted on Figure 5.

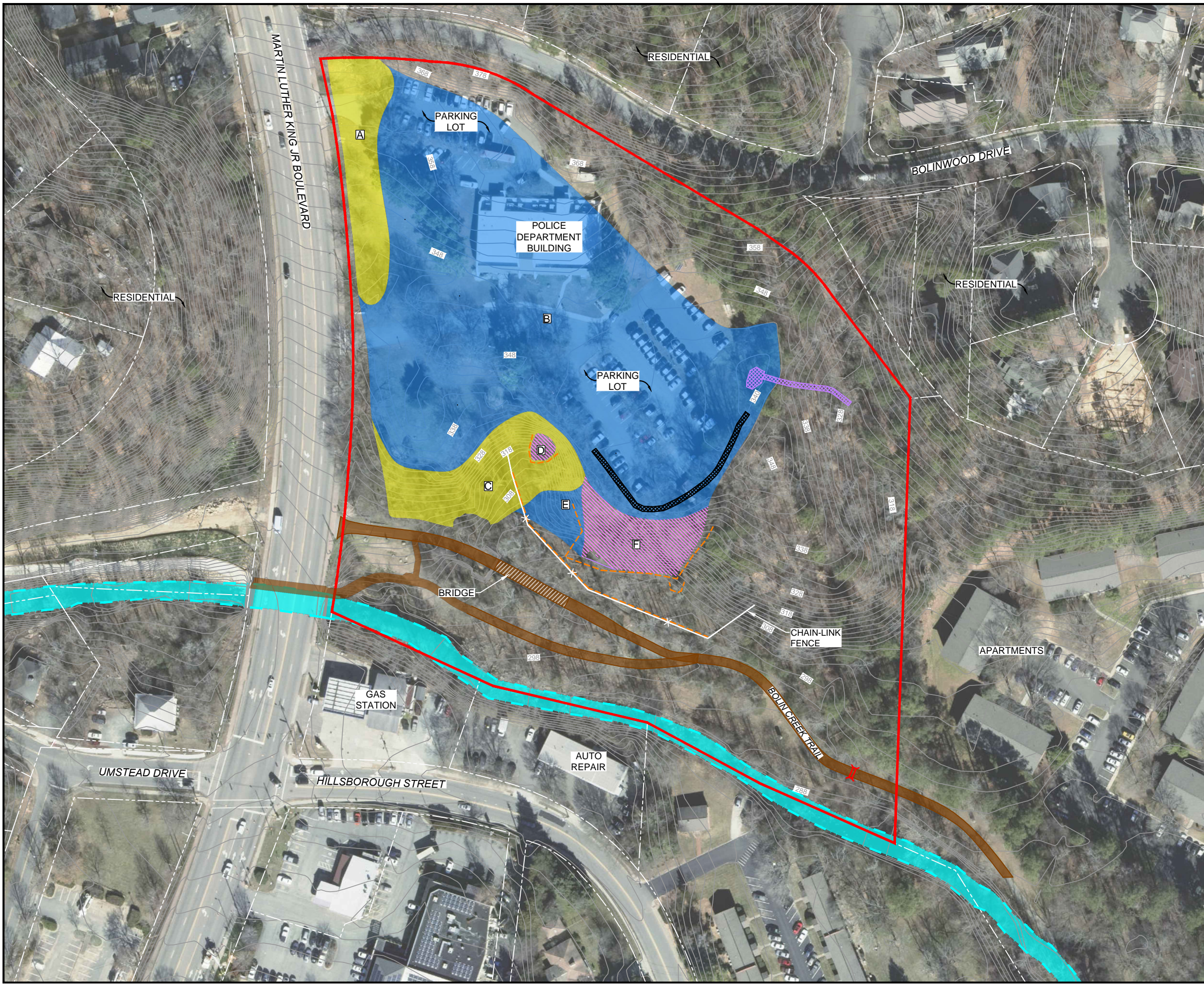
## Recommendations

H&H's recommendations to address potential human-health and ecological risks identified as part of the risk assessment are detailed below. In addition to recommendations related to specific sample locations which are drivers for potential risks, in some cases land-use restrictions (LURs) are recommended to confirm the assumptions made during the risk assessment activities remain valid. LURs are expected to be specified in a future Brownfields Agreement with the DEQ Brownfields Program, which will be filed on the deed for the property and remain in perpetuity. The Brownfields Program requires annual certifications from the property owner that LURs are being complied with in perpetuity, which will confirm that potential risks addressed via LURs will be managed long-term.

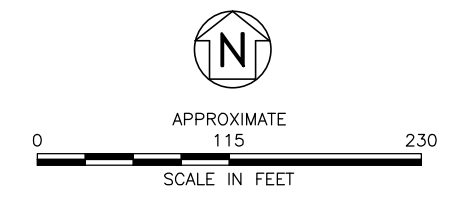
- Exposed CCPs are present in the area of the embankment. The risk evaluation indicated exceedances of acceptable risk levels for a resident, construction worker, and/or ecological receptors based on metals concentrations in several samples of exposed CCPs collected in the embankment area (S-7, HH-9, HH-10, and HH-11). The potential for erosion to transport CCPs from the area of the embankment into the greenway area is considered an additional concern. The Town implemented temporary measures to minimize the potential for erosion as part of the IRMs implemented in 2020; however, H&H recommends implementation of permanent measures to address exposed CCPs and prevent erosion in the embankment area. These measures could effectively be performed in conjunction with site redevelopment activities.
- If the site is redeveloped for residential use, H&H recommends remediation or other actions (ex., excavation, impervious cover to prevent exposure, resampling to verify concentrations) to address impacts in the upper level in the area of sample S-4.
- Outside of the embankment area, the ecological risk screening indicated localized exceedances of ESVs at two soil sample locations within EU #1 (S-4 and MW-7) and one individual soil sample location within EU #2 (SED-13). DEQ does not commonly require evaluation of ecological risks for soil (DEQ, 2021c). As such, DEQ may not require additional actions with regard to the exceedances of ESVs in these samples. If required by DEQ or if the Town wishes to take voluntary actions, H&H recommends remediation or other measures to address or further evaluate potential ecological risks in the area of samples S-4, MW-7, and SED-13.

- To address construction worker risks, H&H recommends implementation of an anticipated LUR requiring preparation of an Environmental Management Plan (EMP), which will detail measures to prevent construction worker exposure, manage impacted soil, and minimize the potential for off-site migration during construction (i.e., redevelopment) activities.
- The risk assessment calculations were based on soil samples collected at depths of 0 to 2 feet below ground surface (ft bgs) for a resident, non-residential worker, and greenway user, and samples collected at depths of 0 to 10 ft bgs for a construction worker. If impacted soil or CCPs at deeper depths are exposed during site redevelopment, additional risk evaluation should be performed to confirm that potential exposure to these soils does not exceed acceptable risk levels. If the site is redeveloped, the Brownfields Program will also likely require confirmatory sampling and risk evaluation in areas of potentially impacted soil or CCPs that are not covered by impervious surfaces (buildings, pavement, etc.) or at least 2 ft of clean fill.
- H&H recommends a LUR preventing the future installation of water supply wells or other use or exposure of groundwater at the site.





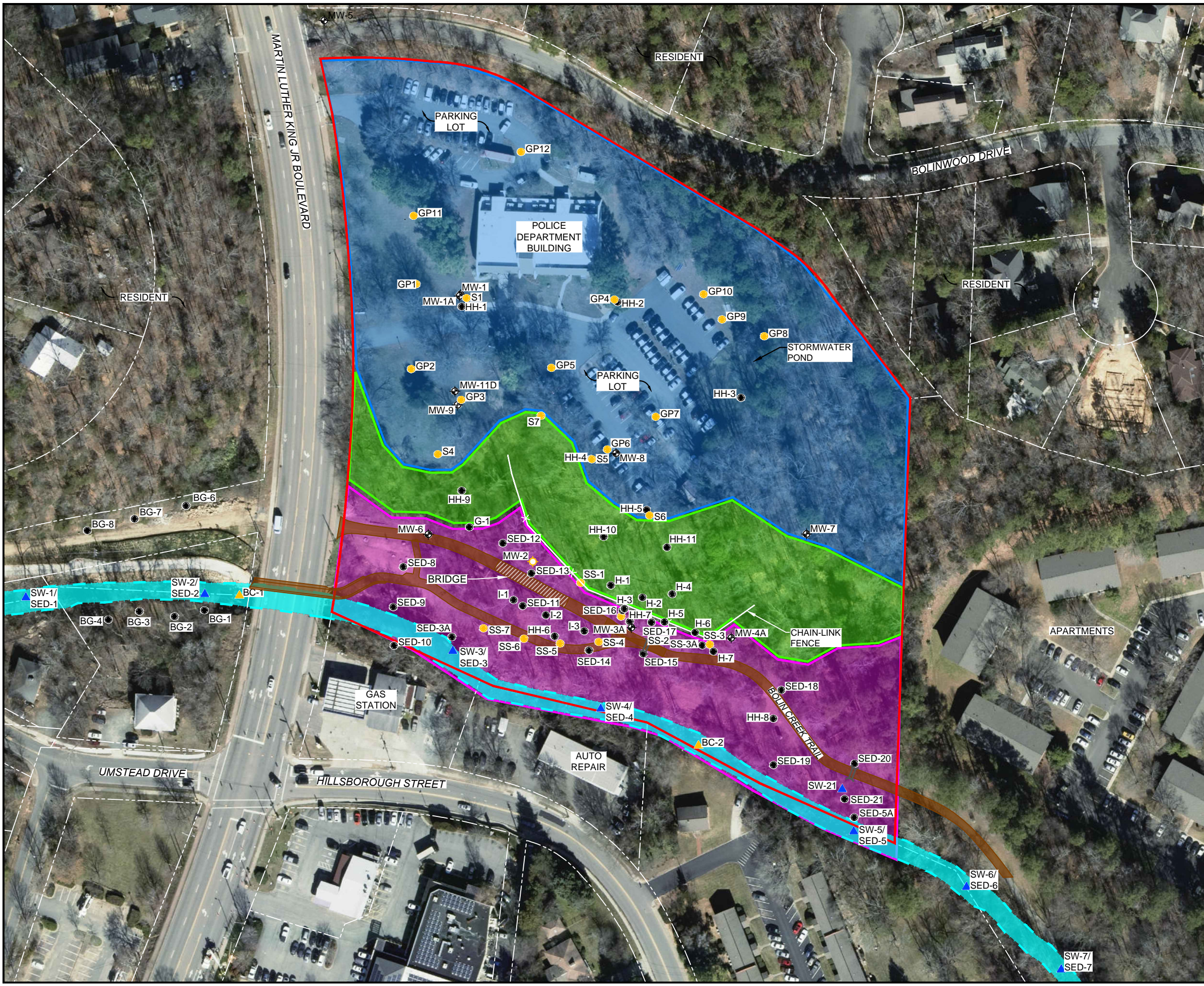
- LEGEND**
- SITE PROPERTY BOUNDARY
  - BOLIN CREEK
  - 328 TOPOGRAPHIC CONTOUR ELEVATION (FT MSL)
  - CCP UNDER > 2 FT COVER
  - CCP UNDER < 2 FT COVER
  - CCP EXPOSED AT GROUND SURFACE (HYDROSEEDED)
  - + STORMWATER CULVERT
  - BOLIN CREEK TRAIL
  - SILT FENCE
  - STORM DIVERSION CHANNEL
  - STORM OUTFALL CHANNEL
  - A CCP AREA DESIGNATION



TITLE <b>SITE MAP</b>	
PROJECT <b>TOWN OF CHAPEL HILL 828 MARTIN LUTHER KING JR. BOULEVARD CHAPEL HILL, NORTH CAROLINA</b>	
 <small>SMARTER ENVIRONMENTAL SOLUTIONS</small>	2923 South Tryon Street-Suite 100 Charlotte, North Carolina 28203 704-586-0007(p) 704-586-0373(f) License # C-1269 / #C-245 Geology
DATE: 6-22-21	REVISION NO. 0
JOB NO. TCH-009	FIGURE NO. 1

S:\AAA-Master Projects\Town of Chapel Hill (TCH)\TCH-009 - Police Station - Remedial Services\Risk Assessment\Figures\TCH-009 20210622-FIG2.dwg, FIG 2, 9/10/2021 1:16:15 PM, shaynes





**LEGEND**

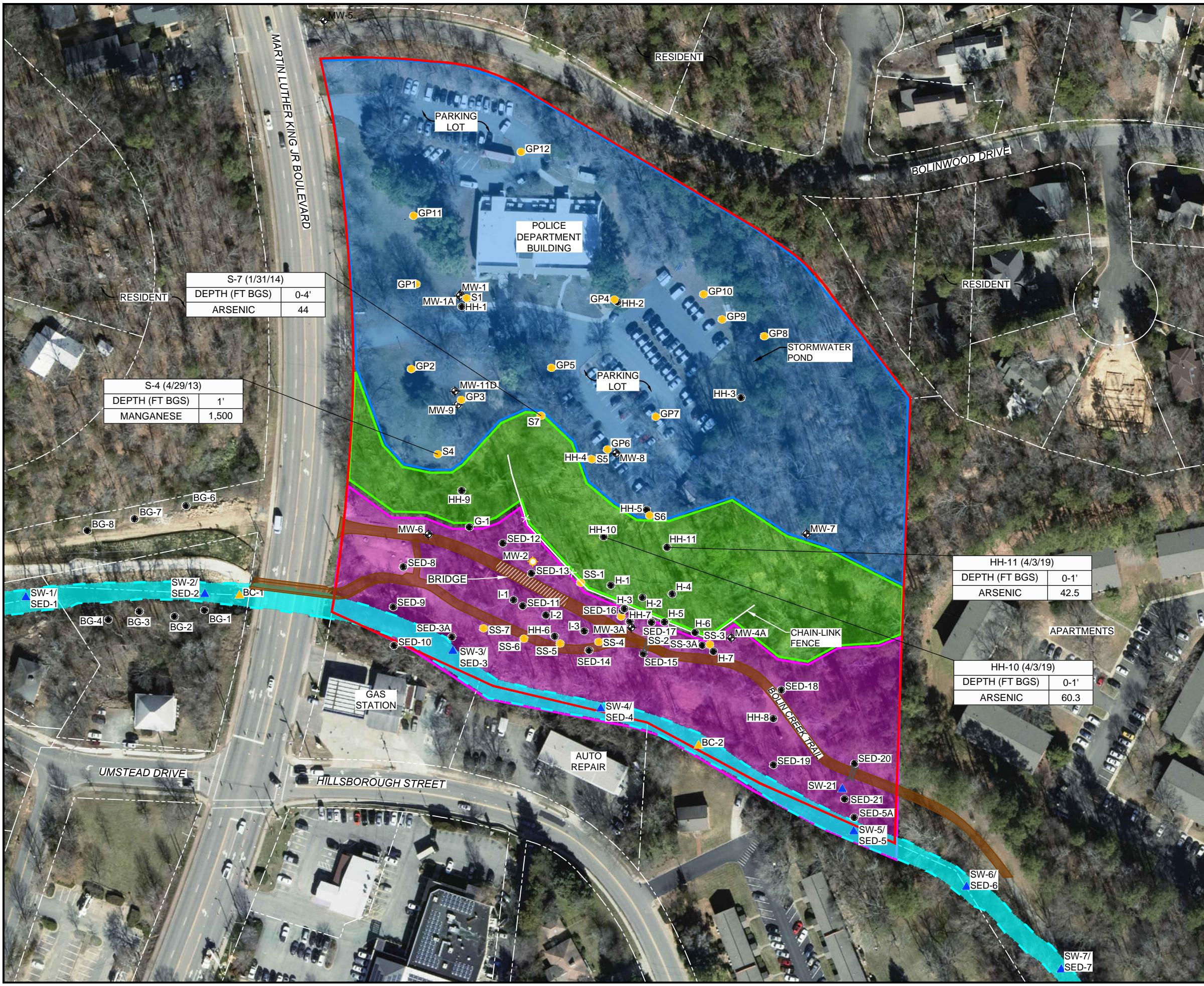
- SITE PROPERTY BOUNDARY
- BOLIN CREEK
- MONITORING WELL LOCATION (FALCON ENGINEERING)
- TEMPORARY MONITORING WELL LOCATION (FALCON ENGINEERING)
- SOIL BORING LOCATION (FALCON ENGINEERING)
- ▲ SURFACE WATER SAMPLE LOCATION (FALCON ENGINEERING)
- MONITORING WELL LOCATION (H&H)
- SOIL SAMPLE LOCATION (H&H)
- ▲ DRAINAGE PATHWAY, SURFACE WATER/SEDIMENT SAMPLE LOCATION (H&H)
- STORMWATER CULVERT
- BOLIN CREEK TRAIL
- EXPOSURE UNIT #1 - UPPER LEVEL
- EXPOSURE UNIT #2 - LOWER LEVEL
- EXPOSURE UNIT #3 - EMBANKMENT

APPROXIMATE  
0 115 230  
SCALE IN FEET

<b>TITLE</b>	
SAMPLE LOCATION AND EXPOSURE UNIT MAP	
<b>PROJECT</b>	
TOWN OF CHAPEL HILL 828 MARTIN LUTHER KING JR. BOULEVARD CHAPEL HILL, NORTH CAROLINA	
<small>2923 South Tryon Street-Suite 100 Charlotte, North Carolina 28203 704-586-0007(p) 704-586-0373(f) License # C-1269 / #C-245 Geology</small>	
DATE: 9-10-21	REVISION NO. 0
JOB NO. TCH-009	FIGURE NO. 2

S:\AAA-Master Projects\Town of Chapel Hill (TCH)\TCH-009 - Police Station - Remedial Services\Risk Assessment\Figures\_20210831.dwg, FIG 3, 9/21/2021, 8:53:22 AM, shaynes





S-7 (1/31/14)	
DEPTH (FT BGS)	0-4'
ARSENIC	44

S-4 (4/29/13)	
DEPTH (FT BGS)	1'
MANGANESE	1,500

HH-11 (4/3/19)	
DEPTH (FT BGS)	0-1'
ARSENIC	42.5

HH-10 (4/3/19)	
DEPTH (FT BGS)	0-1'
ARSENIC	60.3

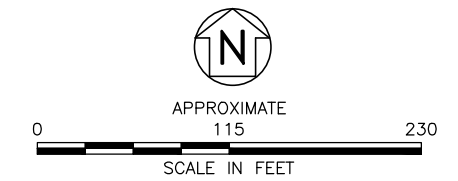
**LEGEND**

- SITE PROPERTY BOUNDARY
- BOLIN CREEK
- ⊕ MONITORING WELL LOCATION (FALCON ENGINEERING)
- ⊕ TEMPORARY MONITORING WELL LOCATION (FALCON ENGINEERING)
- SOIL BORING LOCATION (FALCON ENGINEERING)
- ▲ SURFACE WATER SAMPLE LOCATION (FALCON ENGINEERING)
- ⊕ MONITORING WELL LOCATION (H&H)
- SOIL SAMPLE LOCATION (H&H)
- ▲ DRAINAGE PATHWAY, SURFACE WATER/SEDIMENT SAMPLE LOCATION (H&H)
- STORMWATER CULVERT
- BOLIN CREEK TRAIL
- EXPOSURE UNIT #1 - UPPER LEVEL
- EXPOSURE UNIT #2 - LOWER LEVEL
- EXPOSURE UNIT #3 - EMBANKMENT

**EXAMPLE TABLE:**

SAMPLE ID & DATE	
HH-10 (4/3/19)	
DEPTH (FT BGS)	0-1'
ARSENIC	60.3
RISK DRIVERS	
CONCENTRATION (mg/kg)	

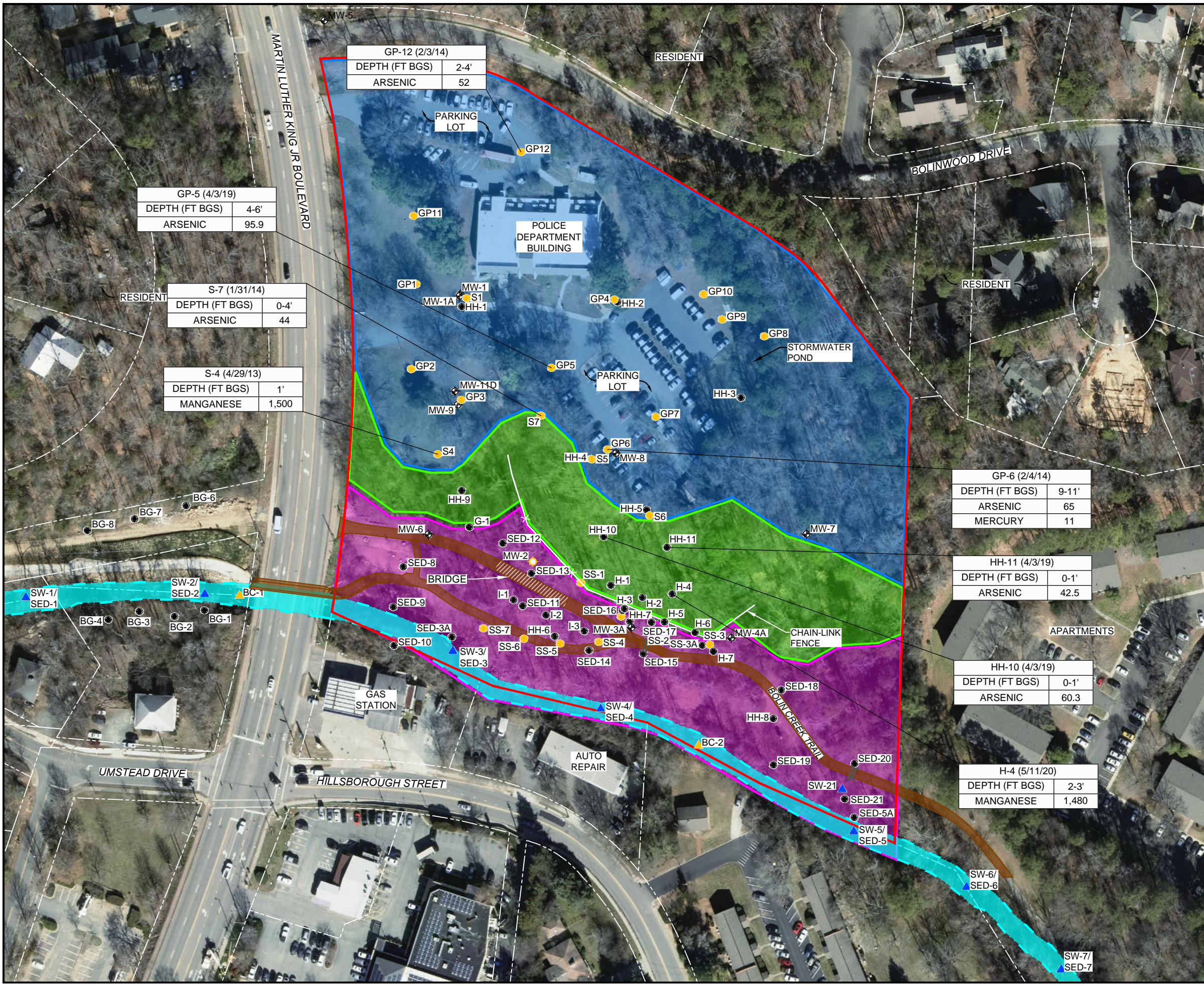
- NOTES:**
- ONLY COMPOUNDS THAT DRIVE EXCEEDANCES OF ACCEPTABLE RISK LEVELS (CARCINOGENIC RISK > 1.0E-04 AND HAZARD INDEX > 1.0) ARE SHOWN.
  - FT BGS = FEET BELOW GROUND SURFACE



<b>TITLE</b> RESIDENTIAL HUMAN HEALTH RISK DRIVERS MAP	
<b>PROJECT</b> TOWN OF CHAPEL HILL 828 MARTIN LUTHER KING JR. BOULEVARD CHAPEL HILL, NORTH CAROLINA	
 2923 South Tryon Street-Suite 100 Charlotte, North Carolina 28203 704-586-0007(p) 704-586-0373(f) License # C-1269 / #C-245 Geology	
DATE: 9-10-21	REVISION NO. 0
JOB NO. TCH-009	FIGURE NO. 3

S:\AAA-Master Projects\Town of Chapel Hill (TCH)\TCH-009 - Remedial Services\Risk Assessment\Figures\Figures\_20210831.dwg, FIG 4A, 9/30/2021 4:12:16 PM, shaynes





GP-5 (4/3/19)	
DEPTH (FT BGS)	4-6'
ARSENIC	95.9

S-7 (1/31/14)	
DEPTH (FT BGS)	0-4'
ARSENIC	44

S-4 (4/29/13)	
DEPTH (FT BGS)	1'
MANGANESE	1,500

GP-12 (2/3/14)	
DEPTH (FT BGS)	2-4'
ARSENIC	52

GP-6 (2/4/14)	
DEPTH (FT BGS)	9-11'
ARSENIC	65
MERCURY	11

HH-11 (4/3/19)	
DEPTH (FT BGS)	0-1'
ARSENIC	42.5

HH-10 (4/3/19)	
DEPTH (FT BGS)	0-1'
ARSENIC	60.3

H-4 (5/11/20)	
DEPTH (FT BGS)	2-3'
MANGANESE	1,480

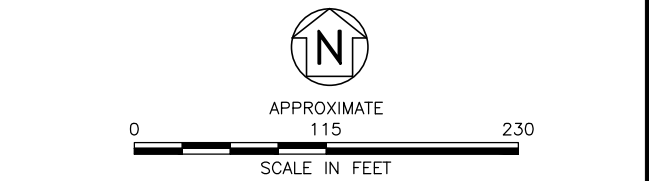
**LEGEND**

- SITE PROPERTY BOUNDARY
- BOLIN CREEK
- MONITORING WELL LOCATION (FALCON ENGINEERING)
- TEMPORARY MONITORING WELL LOCATION (FALCON ENGINEERING)
- SOIL BORING LOCATION (FALCON ENGINEERING)
- SURFACE WATER SAMPLE LOCATION (FALCON ENGINEERING)
- MONITORING WELL LOCATION (H&H)
- SOIL SAMPLE LOCATION (H&H)
- DRAINAGE PATHWAY, SURFACE WATER/SEDIMENT SAMPLE LOCATION (H&H)
- STORMWATER CULVERT
- BOLIN CREEK TRAIL
- EXPOSURE UNIT #1 - UPPER LEVEL
- EXPOSURE UNIT #2 - LOWER LEVEL
- EXPOSURE UNIT #3 - EMBANKMENT

**EXAMPLE DATA TABLE:**

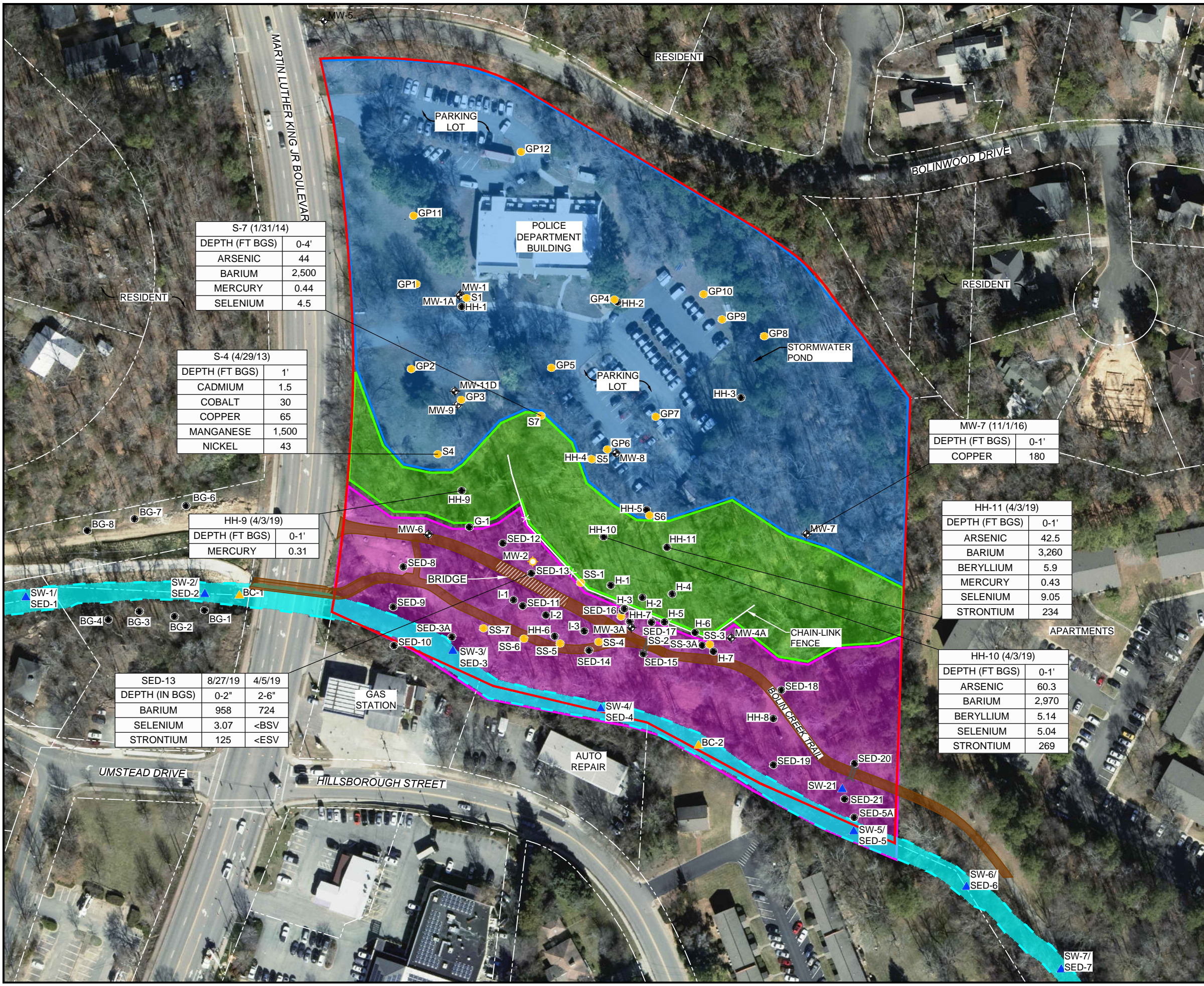
SAMPLE ID & DATE	
HH-10 (4/3/19)	
SAMPLE DEPTH	
DEPTH (FT BGS)	0-1'
CONCENTRATION (mg/kg)	
ARSENIC	60.3
RISK DRIVERS	

- NOTES:**
- ONLY COMPOUNDS THAT DRIVE EXCEEDANCES OF ACCEPTABLE RISK LEVELS (CARCINOGENIC RISK > 1.0E-04 AND HAZARD INDEX > 1.0) ARE SHOWN.
  - FT BGS = FEET BELOW GROUND SURFACE



<b>TITLE</b> CONSTRUCTION WORKER HUMAN HEALTH RISK DRIVERS MAP	
<b>PROJECT</b> TOWN OF CHAPEL HILL 828 MARTIN LUTHER KING JR. BOULEVARD CHAPEL HILL, NORTH CAROLINA	
 2923 South Tryon Street-Suite 100 Charlotte, North Carolina 28203 704-586-0007(p) 704-586-0373(f) License # C-1269 / #C-245 Geology SMARTER ENVIRONMENTAL SOLUTIONS	
DATE: 9-10-21	REVISION NO. 0
JOB NO. TCH-009	FIGURE NO. 4





S-7 (1/31/14)	
DEPTH (FT BGS)	0-4'
ARSENIC	44
BARIIUM	2,500
MERCURY	0.44
SELENIUM	4.5

S-4 (4/29/13)	
DEPTH (FT BGS)	1'
CADIUM	1.5
COBALT	30
COPPER	65
MANGANESE	1,500
NICKEL	43

HH-9 (4/3/19)	
DEPTH (FT BGS)	0-1'
MERCURY	0.31

Sample ID	Date	Depth	Concentration
SED-13	8/27/19	4/5/19	
DEPTH (IN BGS)	0-2"	2-6"	
BARIIUM	958	724	
SELENIUM	3.07	<BSV	
STRONTIUM	125	<ESV	

MW-7 (11/1/16)	
DEPTH (FT BGS)	0-1'
COPPER	180

HH-11 (4/3/19)	
DEPTH (FT BGS)	0-1'
ARSENIC	42.5
BARIIUM	3,260
BERYLLIUM	5.9
MERCURY	0.43
SELENIUM	9.05
STRONTIUM	234

HH-10 (4/3/19)	
DEPTH (FT BGS)	0-1'
ARSENIC	60.3
BARIIUM	2,970
BERYLLIUM	5.14
SELENIUM	5.04
STRONTIUM	269

**LEGEND**

- SITE PROPERTY BOUNDARY
- BOLIN CREEK
- MONITORING WELL LOCATION (FALCON ENGINEERING)
- TEMPORARY MONITORING WELL LOCATION (FALCON ENGINEERING)
- SOIL BORING LOCATION (FALCON ENGINEERING)
- ▲ SURFACE WATER SAMPLE LOCATION (FALCON ENGINEERING)
- MONITORING WELL LOCATION (H&H)
- SOIL SAMPLE LOCATION (H&H)
- ▲ DRAINAGE PATHWAY, SURFACE WATER/SEDIMENT SAMPLE LOCATION (H&H)
- STORMWATER CULVERT
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- EXPOSURE UNIT #1 - UPPER LEVEL
- EXPOSURE UNIT #2 - LOWER LEVEL
- EXPOSURE UNIT #3 - EMBANKMENT

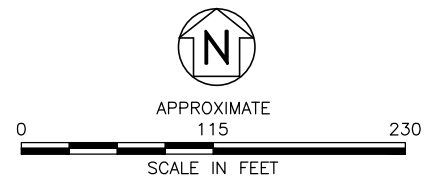
**SAMPLE ID & DATE**

S-4 (4/29/13)	
DEPTH (FT BGS)	1'
CADIUM	1.5
COBALT	30
COPPER	65
MANGANESE	1,500
NICKEL	43

**CONCENTRATION (mg/kg)**

**CONSTITUENT**

- NOTES:**
- ONLY SAMPLES EXCEEDING ECOLOGICAL SCREENING VALUES (ESVs) AND BACKGROUND SCREENING VALUES (BSVs) ARE SHOWN.
  - FT BGS = FEET BELOW GROUND SURFACE  
IN BGS = INCHES BELOW GROUND SURFACE  
mg/kg = MILLIGRAMS PER KILOGRAM



<b>TITLE</b>	
ECOLOGICAL RISK DRIVERS MAP	
<b>PROJECT</b>	
TOWN OF CHAPEL HILL 828 MARTIN LUTHER KING JR. BOULEVARD CHAPEL HILL, NORTH CAROLINA	
2923 South Tryon Street-Suite 100 Charlotte, North Carolina 28203 704-586-0007(p) 704-586-0373(f) License # C-1269 / #C-245 Geology	
<b>DATE:</b> 9-10-21	<b>REVISION NO. 0</b>
<b>JOB NO. TCH-009</b>	<b>FIGURE NO. 5</b>